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ABSTRACT

This study describes an attempt to introduce change into an educational system. A new science program (MATAL) consisting of new teaching materials, teaching strategies and training courses--was developed and implemented in kindergarten classrooms. Major hypotheses were that (1) the kindergarten is a system; educational change will be achieved through the operation of a change factor and the involvement of all the components of the system in the performance of change, and (2) the level of change will be lowered if, among the components of the system, a supporting change agent is lacking. To test these hypotheses 40 kindergarten classes in Tel Aviv, Israel, were divided into two groups. Group A teachers and supervisors received extensive pretraining by teacher trainers. Group B received neither pretraining nor assistance during implementation. To evaluate changes in the educational system, 10 research devices were prepared to measure attitudes of the participants, knowledge of the teaching team, teaching performances in the classroom, utilization of time, students' achievements, and interpersonal relationships. Findings supported the hypotheses. The kindergarten operated as a system. Change occurred when the change factors operated in all the components of the system. (Author/RH)

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Some Factors Affecting Teacher Behavior and Pupil Performance*

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The changes in education, which occurred in the sixties and were brought about by scientific and technological modernization, social and economic development and the democratization of the elementary level of education, presented educators with new needs and demands for educational reforms (Adar 1956, Feitelson 1953, Nafthali 1972). These reforms are related to the fields of curricula, teaching methods, and the organization of the educational system. In the field of curricula the change was manifested in the development of new programs in science and mathematics for the elementary school level (Karplus 1965, Gange 1965, Goodlad 1966, Schools Council 1970), and in the development of a variety of specific programs for the kindergarten level**. In the field of teaching, strategies were adapted to the individual differences among students (Pinder 1966, Brickell 1964, Standing 1966). At the organization level, the new trend aimed for the development of alternative learning set-ups within one organizational structure and for the adaption of learning methods to the various organizational types.

However, in spite of the tremendous investments in curricula development and despite the financial resources invested in the implementation of innovative techniques and technologies, many of the programs failed to achieve the expectations of their developers (Goodlad 1964).

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** (Camp 1975, Berelter-Engleman 1956, Evans 1971, Nimnicht 1973, Spodek 1973, Weikart 1970).
In Israel (Fajans-Glick 1975, Bilski-Cohen 1974, Lombard 1973, Stachel 1975, Smilansky 1973).

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The major efforts during the sixties were directed toward changing the isolated elements in education, such as the teacher, the program, the physical set-up of the classroom ect. These elements underwent experimentation separately and within limited frameworks (Goodlad 1975). The majority of innovative ideas did not penetrate the entire educational system, and since they were not an integral part of the system, they could demonstrate only partial and limited influence.

In the present study, an empirical attempt was made to introduce change in the educational system, to observe the subsequent processes, to understand the causes, and to formulate a mode which would clarify the relationships among the variables of change and their outcomes. A new science program, MATAL*, was developed as this factor for change. This program differs in its goals, content, and teaching methods from the program presently existing in the Kindergarten.

This new program is characterized as follows:

a) Its content is related to various disciplines, in contrast to programs based on a distinct disciplinary approach.

b) The internal structure of the material is accompanied by a defined system of concepts for learning purposes, the concepts being graded and the activities structured in a sequence and at increasing levels of difficulty, in contrast to the existing programs which are based on an eclectic, unstructured approach with the concepts submerged under much diffused information.

c) The character of the program requires a change in the teaching strategy. Since it is based on activity and on learning through discovery, it calls for adaptation of the teaching material to the individual differences in the children's ways of

*The MATAL kindergarten science teaching program is part of the elementary science project developed at Tel-Aviv University in conjunction with the Israel Center for Science Teaching and the Ministry of Education and Culture.

learning. As it is graded and structured, it permits consideration of the child's learning pace. It demands of the teacher a transition from collective (frontal) activity to group and individual activities and a transition from teaching aimed mostly at imparting information to the development of ways of thinking and understanding how to learn.

The program is closely coordinated with mathematical skills and throughout the program there is an emphasis on language development as one of the means for children to react to and represent what they discover in their environment. An attempt is also made to integrate concrete experiences with the creative arts by means of which the child can express his experiences, both on the cognitive and affective level spontaneously and individually with the materials of his choice.

The Kindergarten classes for the five year old were chosen as a target for change, since the kindergarten is a system administratively and educationally independent and thus can be better controlled. The kindergarten as such is supervised by a hierarchical structure comprised of the central administrative office, the central supervision of kindergarten office and the direct supervisor. Authority is exerted through a vertical one-way flow of institutionalized inputs; from the central system through the direct supervisor into the kindergarten. Therefore introducing any change in the kindergarten is entirely dependent upon the influence of the control system.

This structure is illustrated in Figure 1.

Insert Figure 1 about here

Our strategy for change was based on a system-approach; The components of the system towards whom the research was directed were: the central supervisory office, the direct supervisor, the kindergarten teacher and the students. The inputs were

related to the content of teaching, the teaching and the organization. In terms of content, the inputs were; a new program and new teaching materials. In the field of teaching-a different teaching strategy, a new set-up of training courses and a new set-up of guidance was developed. As opposed to the vertical flow of inputs which characterized the existing model, the flow of inputs in the research model was horizontal and simultaneously directed towards all the identified components of the system. Through this approach we attempted the output to be expressed in a change in classroom processes, teaching performances and student achievements.

Insert Figure 2 about here

In order to help the teacher with the implementation of the innovative ideas the following acts were carried out:

Preliminary exposure of the teachers to the content of the program and the teaching strategies through a yearly course prior to the implementation in the classes.

Fostering the supervisors awareness of the objectives and content of the program through explanatory lectures, courses and guided visits to trial classes.

Supply the teacher and students with all the equipment necessary for the implementation of the program.

Initiating a supportive system of Teacher-Trainers composed of teachers who demonstrated mastery of the theoretical background of the program and were successful in the implementation. The Teacher-Trainers assisted the new implementers in their classes and helped in faciliating the transition period at the initial stage of implementation.

Developing a circular feed-back system in order to evaluate the program and the

model of implementation. The feed-back system included the kindergarten teachers, the teacher-trainers who guided the kindergarten teachers, the supervisors who visited the classes and observed the teachers and the Teacher-Trainers, and observers of the project who visited the classes and observed the processes of implementation and the outputs. In this model a major position is given to the interaction among the components of the system as a means of bringing forth change in the kindergarten.

In the light of these actions four major hypotheses were formulated:

1) The kindergarten is a system; educational change will be achieved through the operation of a change factor and the involvement of all the components of the system in the performance of change.
2) The level of change will be lowered if among the components of the system a supporting change agent will be lacking.

We furthermore assumed that within each one of the two treatments which follow from these hypotheses variation in the levels of change will result from the attitudes of the supervisors to the program and their attitude toward and relations with the supporting change agent. Therefore, two secondary hypotheses followed the major ones:

3) Negative attitudes of the supervisors towards the elements of change will lower the level of change, even with the existence of the supporting change agent.
4) Positive attitudes of the supervisors towards the elements of change will raise the level of change, even with the absence of the supporting change agent.

In order to examine the above-mentioned hypotheses, two groups of kindergarten classes were chosen:

Group A: This group comprised a system which included the teachers, the students, and the supervisors. In this group, the change was introduced through

the entire supporting system; i.e., the project team and the change agents (the Teacher-Trainers). The teachers attended extensive training courses prior to the implementation of the program. Further extensive training was given throughout the implementation period concerning the subject matter related to the program and special treatment of problems which followed the implementation process. Intensive guidance was given by the teacher-trainers who were supportive with their pragmatic implementation of the program in the classroom. Their work was on an individual and concrete level. An extensive course was available for the supervisors, conducted by the project team and dealing with the principles of the program and ideas for change and innovation.

The work in Group A was characterized by daily activities of the program carried out in small groups (6 children) and with individual children. Teaching was based mostly on self activity of children with objects and materials suggested in the program and available in their immediate environment. The teacher received individual guidance in her class related to the theoretical and pragmatic aspects of the program such as: explanation and extention of the written material, explanation of concepts unknown to the teacher, adjusting of activities, suggested in the program, to the level of the class or group. Organization of learning space, organization of learning time, use and maintenance of equipment etc. The teachers visited various schools and observed the work of different teachers. They were also engaged in discussion groups for interchange of ideas and clarification of problems.

Group B: This group consisted of the teacher, the students, and the same supervisors as in Group A. The written program and the materials were sent

to the kindergartens, but the teachers did not attend any course prior to the implementation, nor did they receive any assistance throughout the implementation period.

In this group the program was carried out in a fashion similiar to the existing ways of kindergarten work; where content is chosen by the teacher, activities are predominantly verbal and characterized by frontal class work experimentation is usually accompanied by frontal demonstrations presented by the teacher. Except for activities related to dramatic or constructive play, "group" activities exist mainly in the field of creative arts where children are sitting in groups but are mostly working individually.

Subjects:

The two groups consisted of 20 classes each, a total of 40 classes and 872 students. The classes were located in the Tel Aviv region and the central region of the country. The 40 teachers were chosen according to their professional status (all were qualified teachers), tenure, and their supervisor's evaluation. Ten supervisors participated in the experiment; each supervised four classes: two classes of Group A and two classes of Group B. Four Teacher-Trainers worked with the 20 classes of Group A.

The experiment continued throughout the entire school year - October 1974 until the end of June 1975.

For the evaluation of the changes in the educational system, ten research devices were prepared with which we attempted to measure the attitudes of the participants, the knowledge of the teaching team, the teaching performances in the classroom, utilization of time, students' achievements, and interpersonal relationships. The relationships among the various components of the system were analyzed using cluster analysis, which was programmed for classifying qualitative data.

Insert Figure 3 about here

Findings

The major hypotheses were empirically established: the kindergarten operated as an educational system. The change occurred when the change factors operated in all the components of the system. The analysis of the findings for the entire population revealed the existence of relationships among the factors of change (the inputs), the processes, and the outputs. Within this framework, the following profiles can be described:

(1) Maximum output, as measured through change in student achievement and teaching performance, was achieved by the presence of the supporting change agent (Teacher-Trainers), a high level of teacher's knowledge of the program, and positive interpersonal relationships between the change agent and the operating elements in the system.

(2) A decrease in the relative levels of output, as measured above, was related to the absence of the supporting change agent (Teacher-Trainers), the absence of interpersonal relationships between the operating elements in the system, and an inferior level of knowledge on the part of the teacher.

Analysis of the findings for the population of Group A revealed the following profiles:

(3) Maximum output, as measured through change in student achievement and teaching performance, was achieved by the presence of supporting change agent (Teacher-Trainers), a high level of teacher's knowledge of the program, and positive interpersonal relationships between the change agent and the operating elements in the system.

(4) No change in the relative level of output, as measured above, was achieved through the presence of the supporting change agent, an average level of knowledge on the part of the teacher, and a negative attitude of the supervisor towards the program and the change agent.

Analysis of the findings for the population of Group B revealed the following profiles:

(5) No change in the relative output was related to the absence of the supporting change agent, an average level of knowledge on the part of the teacher, and a positive attitude of the supervisor towards the new program and positive interpersonal relationships with the teacher.

(6) A decrease in the relative level of output, as measured above, was related to the absence of the supporting change agent (Teacher-Trainers), the absence of interpersonal relationships between the operating elements in the system, and an inferior level of knowledge on the part of the teacher.

In light of these findings, a model was developed which suggests a qualitative relationship between the change which operates in the system and the variables of the system. The model was described as follows:

$$C = F \frac{t\ N_s\ P}{R\ (r_1 r_2 \cdots r_n}$$

Where:

C = Level of Change in the system

t = Time devoted to the implementation of the change

Ns = Number of Sub-Systems

P = Permeability of the system

R = General Resistance of the system to change

r_1, r_2 = Resistance of Sub-Systems

It can be generalized that the level of change is in direct ratio to the time devoted to the implementation of the change, the number of sub-systems into which the change is introduced, and the amount of permeability of the total system. The level of change is in inverse ratio to the general resistance of the system (or its sub-systems).

The details of the changes which took place in the system can be summaried as follows:

(1) The attitudes of the two groups of teachers towards the new program demonstrated a tendency to concentrate on an average, accepted system with no major qualitative change occuring during the experiment.

(2) The teachers of Group A, who received assistance from a supporting change agent, exhibited more openness towards change and innovation in early childhood education.

(3) The attitudes of the supervisors towards teacher-trainers demonstrated reserve and lack of involvement.

(4) In the test of knowledge of the program, from a total of 26 possible points, the teacher-trainers achieved an average mark of 20.5; Group A teachers - 16.4, Group B teachers achieved an average mark of 12.5.

(5) A qualitative improvement in teaching performance and in student achievements was observed in Group A, in contrast to a qualitative decrease in the same measures in Group B.

(6) Utilization of time on class work and group work devoted to activities of the Matal Program was higher in Group A.

(7) A low correlation existed between the teacher's level of knowledge of the program and change in the students' achievements. A low correlation existed between the amount of time spent on class work and group work activities related to the program and the change in students' achievements.

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Figure 1:
Implementation of a learning program in the existing model

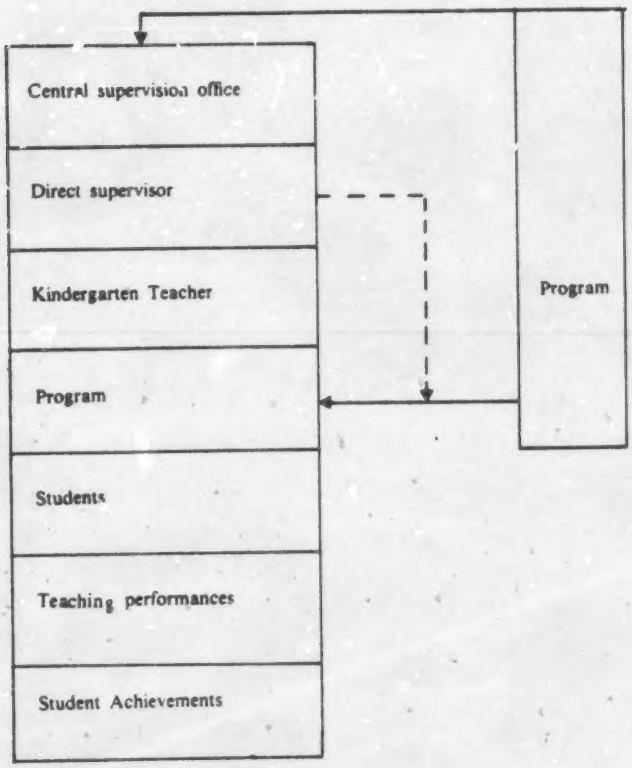

Figure 2:

Implementation of MATAL Program in the New Model

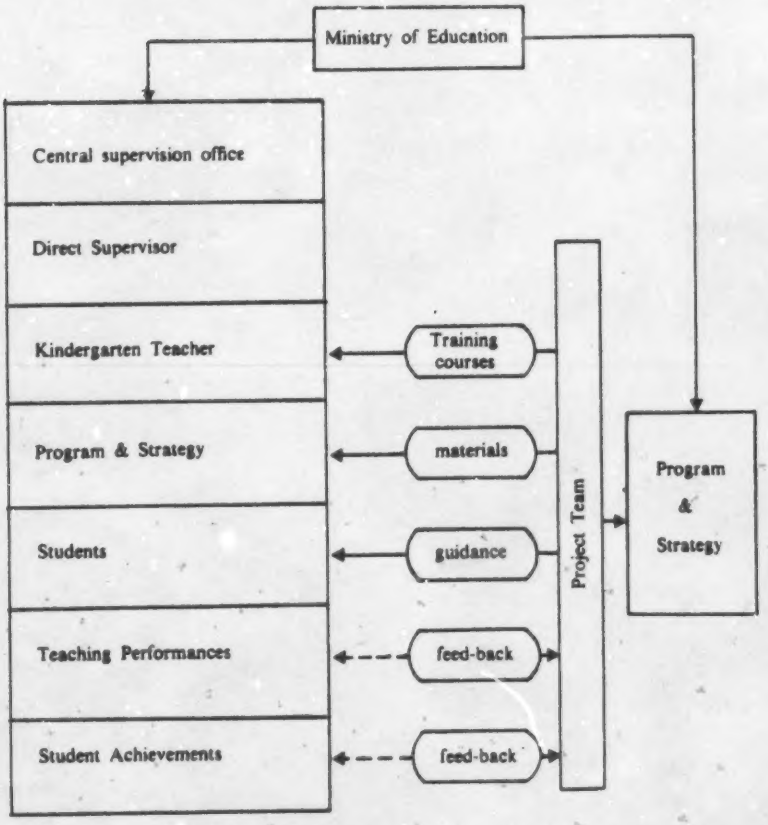

Figure 3

Relationships between the Components of the System and the Objects of the Research